The Obesity Epidemic and Its Impact on Urologic Care

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Although heart disease and cancer are the number one and two causes of death in the United States, respectively, obesity is gaining speed as a contributing cause to both of those conditions, along with diabetes, arthritis, dyslipidemia, coronary heart disease, gallbladder disease, and certain malignancies. Nearly one-third of the adults in the United States is overweight with a body mass index (BMI) greater than 25 kg/m^2, and another third of the adult population is obese, with a BMI greater than 30 kg/m^2. This article reviews the root causes of obesity, the societal implications, and the implications of obesity on various urologic diseases.

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KEY WORDS

Obesity • Morbid obesity • Body mass index • Exercise • Weight loss • Diet • Epidemic

More than 20% of adults in the United States are clinically obese, defined by a body mass index (BMI) of 30 kg/m^2 or higher, and an additional 30% are overweight, with a BMI between 25 and 30 kg/m^2.[1] An environment that promotes excessive food intake and discourages physical activity lies at the root of the current obesity epidemic. Although humans have excellent physiologic mechanisms to defend against body weight loss, they have only weak physiologic mechanisms to defend against body weight gain when food is abundant. So much has been discussed about the obesity epidemic that it's easy to think the issue is being blown out of proportion. After all, people putting on a few pounds may not seem to warrant the proclamation of a national emergency. Although obesity may not attract the degree of attention that heart disease and cancer do, it is a serious public health issue. Experts agree that, as more and more obese children become obese adults, the diseases associated with obesity, such as heart disease, cancer, and particularly diabetes, will surge.

The obesity epidemic in the United States is an unintended consequence of the economic, social, and technologic advances realized during the past several decades. The food supply is abundant and low in cost, and palatable foods with high caloric density are readily available in prepackaged forms

and at fast-food restaurants. Labor-saving technologies have greatly reduced the amount of physical activity that used to be part of everyday life, and the widespread availability of electronic devices in the home, school, and office has promoted a sedentary lifestyle, particularly among children.

A recent study estimated that medical expenditures attributed to overweight and obesity accounted for 9.1% of total US medical expenditures in 1998, and might have reached $78.5 billion dollars.[2] Today, the healthcare costs attributed to obesity are estimated to be $190 billion—nearly 21% of total US healthcare costs.[3] Expenditures will continue to rise, particularly due to increases in the prevalence of obesity and the cost of related healthcare.

Total healthcare costs attributable to this obesity epidemic are expected to double every decade, reaching $860.7 to $956.9 billion by 2030, accounting for 16% to 18% of total US healthcare costs, or 1 in every 6 dollars spent on healthcare.[4] In addition, obesity is likely to result in a decreased life expectancy for our population. Current US generations may have a shorter life expectancy than their parents if this obesity epidemic cannot be controlled.[5] Based on nationally representative data and the assumptions of a future of increased obesity rates, along with increased healthcare costs, this paints an alarming picture of the future obesity epidemic. Projections show that if the trends continue, in 15 years, 80% of all American adults will be overweight or obese.[6]

The Multifactorial Causes of Obesity

Although the underlying causes of our obesity epidemic appear to be obvious—overeating, fast food, large portion sizes, vending machines with calorie-intense items, increased use of inexpensive foods high in high fructose corn syrup, high-calorie school lunches, and too little exercise—there is a lack of evidence to demonstrate these issues as the *only* factors.[7]

Increased caloric consumption is clearly part of the obesity epidemic. Research from Stanford University (Stanford, CA) indicates that another major culprit is too little physical activity. From 1994 to 2010, the percentage of adult women who did no physical activity in their spare time increased from 19% to nearly 52%, and the number of sedentary men increased from 11% to almost 44%. Over the same period of time, the average BMI for women increased by 0.37% per year. A review of 20 long-term studies showed that obesity decreases life expectancy by 6.5 to 14 years when compared with the life expectancy of people of normal weight.[8]

Obesity is associated with inflammation, and microbes may play a role in its development; there is animal and theoretical evidence that inflammation and microbes play a role in some individuals.[7] Worldwide, there has been a trend toward increasing mean pregnancy age, and there is experimental and demographic evidence that this is contributing to the rising rate of obesity in women.[9]

There is strong evidence of genetic tendencies toward obesity in families as well. Maes and coworkers[10] postulate that the hereditability of body fat ranges from 25% to 75%.[10]

Sleep deprivation is clearly associated with obesity, and there has been a trend toward a decreased amount of sleep in many populations over the past 40 years.[7] Sleep has a profound effect on metabolic hormones, including insulin and leptin. Leptin is a hormone made in fat cells that decreases appetite. Levels of leptin are lower in thin individuals and elevated in the obese. Leptin levels are lowered by decreased sleep duration, often resulting in hunger, frequently followed by excessive eating.[11]

Many medications are well known to have an association with weight gain. These include corticosteroids, oral contraceptives, psychotropic medications, medications used to manage diabetes, and some antihypertensive agents.

Impact of Obesity on Urologic Diseases

The impact of obesity on our society is growing at an alarming rate. When treating our obese patients with myriad urologic conditions, clinicians have an opportunity not only to improve their overall health, but to help them with self-improvement opportunities for many nonurologic conditions as well. In addition to prostate cancer, there are other urologic conditions that can be modified and improved by maintaining proper weight.

Prostate Cancer

The Cancer Prevention Study (CPS) II showed a direct relationship to increasing BMI and prostate cancer mortality, as reported by Amling,[12] who also noted that obesity was associated with worse pathologic features and a higher rate of biochemical recurrence of prostate cancer.

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The data regarding obesity and development of prostate cancer are not without some controversy. Several large studies have linked an increased BMI to the development of prostate cancer.[13,14] Simultaneously, other studies have failed to confirm a direct relationship between an increased risk of prostate cancer and obesity, including large studies from the United States, Sweden, and Norway.[15,16]

Although the risk of development of prostate cancer in the face of obesity is favored by the epidemiologic literature, there are conflicting data. However, there is clearly an increased risk of dying of prostate cancer in the face of obesity. Two large studies sponsored by the American Cancer Society (CPS I and CPS II) clearly demonstrated that men with a BMI greater than 30 kg/m^2 were significantly more likely to die of prostate cancer. There was a 27% increased risk of prostate cancer death in obese men in CPS I, and a 21% increased risk prostate cancer death in CPS II.[17] Other studies confirm the increased risk of dying of prostate cancer to be heightened by obesity, so there appears to be no controversy on this aspect of the disease.[18]

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Urinary Incontinence

Urinary incontinence in women could appear to be aggravated by obesity when considering the effects on the abdominal panniculus exerting unwanted pressure on the pelvic organs, uterus, bladder, urethral sphincters, and vagina. The effect of obesity on the sphincter mechanism that controls continence is detrimental to bladder control. Weight loss in obese women has been demonstrated to improve continence. In a large prospective study reported by Subak and coinvestigators in the Program to Reduce Incontinence by Diet and Exercise (PRIDE) study,[19] 338 overweight and obese incontinent women were randomly assigned to an intensive weight-loss, exercise, or structured education program in a 2:1 ratio. The women in the interventional arm at 6 months had substantially more weight loss (7.8 kg vs 1.5 kg). In addition, as the primary endpoint, the interventional arm showed substantial reduction in incontinence episodes at 6 months compared with the control group: 47% reduction versus 28% reduction.[19]

A follow-up at 12 and 18 months was reported by the PRIDE group the following year. There was a slight reduction at 18 months in weight loss compared with the 6-month time point (8% vs 5.5%). This demonstrates the difficulty of maintaining weight loss even in an intense program. Weight loss in the control arm remained at approximately 1.5% throughout the 18 months. With regard to incontinence, the intervention group had a reduction of stress incontinence episodes through 12 months and improved satisfaction through 18 months compared with the control group.[20]

Nephrolithiasis

Nephrolithiasis is strongly influenced by weight; a higher BMI is associated with a higher risk of stone formation.[21] A total of 84,225 women with no previous history of nephrolithiasis were enrolled in a large study between 1993 and 1998; median follow-up was 8 years. Not only was increased caloric intake associated with increased stone risk, but a sedentary lifestyle also had a negative impact on stone formation; both a decreased caloric intake and increased activity can have a salutary effect on stone formation. It is noteworthy that a caloric intake under 1800 kcal/d did not offer further protection from nephrolithiasis.[21] A more recent study reported the relationship between visceral adipose tissue seen on computed tomography scan had a greater impact on stone formation than simply elevated BMI alone.[22]

Hypogonadism

Low testosterone (T) has been associated with obesity and the metabolic syndrome.[23] Obesity impairs biosynthesis of testosterone within the testis. Several studies have confirmed a negative relationship between the indicators of obesity, such as BMI, waist circumference, and low T.[24] Obesity and low T is a "chicken versus egg" proposition; obesity impairs testicular production of T, and low levels of T in turn increase the accumulation of fat, especially abdominal/visceral fat. This increased abdominal fat may lead to additional medical problems, including the development of type 2 diabetes and metabolic syndrome, and increased cardiovascular risk.[25] Encouraging weight loss as a way to increase T in obese men with low T is a natural and valid approach. T replacement in obese men has the potential to lower BMI, improve sexual function

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and glucose tolerance, enhance cognition, and improve overall well-being.[23]

Erectile Dysfunction

Obesity is a risk factor for erectile dysfunction (ED), and as Traish and colleagues[24] have postulated, the link between obesity and ED may lie in androgen deficiency and endothelial dysfunction. There is little doubt that ED is common, affecting millions of men, and has a detrimental effect on quality of life.[26]

Modifiable risk factors, including diet, exercise, and maintenance of normal BMI, have a salutary effect on ED. Men with a BMI greater than 28.7 kg/m^2 have a 30% greater risk for ED than men with a normal BMI of 25 kg/m^2 or less.[27] In a study of 110 obese men with ED published by Esposito and associates,[28] 55 were put in an intense program to lower their body weight by 10% or more, and 55 were included in the control arm. The investigators concluded that "lifestyle changes are associated with improvement in sexual function in about one-third of obese men with ED at baseline." The lifestyle changes in the study included weight loss and increased physical activity.

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Kidney Cancer

Obesity is a recognized risk factor for the development of kidney cancer. Other known risk factors include genetics, age, sex, and smoking. Age, sex, and genetics are fixed, but obesity and smoking are modifiable risk factors for the development of kidney cancer.[29,30]

The reasons for the increased kidney cancer risk in the obese population may include increased levels of insulin, changes in cholesterol metabolism, immune system alterations, and increased levels of estrogens and growth factors.[31] Luo and colleagues[31] reviewed data in more than 140,000 women, age 50 to 79 years, participating in the Women's Health Initiative. During the study period, with an average of 7.7 years' follow-up, 269 cases of renal cell carcinoma (RCC) were seen. Obesity was a significant factor in the development of RCC, especially in women with central adiposity. Women whose weight fluctuated more than 10 times had a 2.6 times increased risk for development of RCC.

Urinary Tract Infection

In clinical practice, we observe that obese patients appear to have more urinary tract infection (UTIs) than those patients with normal BMI. Two studies examining large patient databases—one from Israel and one from the United States—demonstrated the statistical risk of UTI in the obese.

In the Israeli study, 42,703 men and 110,736 women were followed for the first UTI diagnosis over an 18-month period. During the study period, 9.4% of men and 22.7% of women had a UTI. The hazard ratio was 2.38 for obese men and 1.25 for obese women. It is noteworthy that, in this study, the obese patients were extremely obese, with a BMI greater than 50 kg/m^2.[32] In the US study, insurance claims were reviewed over a 5-year period. A total of 95,598 subjects were identified, and the incidence of UTI was 13% in women and 0.84% in men. At all levels of obesity, the risk for UTI, including pyelonephritis, was higher in the obese subjects as compared with the nonobese subjects.[33]

Surgical Complications

Operating on an obese patient, even a minor procedure such as an in-office vasectomy, and certainly any major surgical undertaking, is stressful for the surgeon. From a technical standpoint, surgery is more difficult in the obese patient. As the prevalence of obesity in our society continues to escalate, surgeons face the duel dilemma of the difficulty of the surgery itself, along with the increased risk of postoperative complications. Postoperative complications associated with obesity include pulmonary and cardiac disorders such as hypoventilation, atelectasis, pulmonary embolism, and arrhythmias. Metabolic imbalances and wound infection risks also escalate in the obese patient.[34] Although postoperative morbidity is strongly linked with obesity, as noted by Doyle and associates,[34] it is interesting to note that, in several studies, obesity was not linked to significant risk in postoperative mortality.[35,36]

Postoperative complications associated with obesity include pulmonary and cardiac disorders such as hypoventilation, atelectasis, pulmonary embolism, and arrhythmias.

Male Infertility

Although many obese men have adequate semen parameters that can result in a pregnancy, obesity is a risk factor for male-factor infertility. Although the relationship is not fully understood, it may relate to the fact that obese men have an abnormal hormone milieu. These men may also exhibit a reduction in inhibin B levels without a compensatory increase in follicle-stimulating hormone levels.[37] In a

Danish report, among 1558 military recruits, several semen parameters were less favorable in men with BMIs above 25 kg/m^2, and, incidentally, in those with BMIs below 20 kg/m^2 as well.[38]

Lower Urinary Tract Symptoms

Obesity has been linked to lower urinary tract symptoms and benign prostatic hyperplasia (BPH).[39] Not only is BPH associated with obesity, but a Scottish study of approximately 400 men concluded that obese men do not attain the degree of improvement from transurethral resection of the prostate when compared with a similar cohort of nonobese men.[40]

Conclusions

Obesity increases the risk of many urologic conditions, both benign and malignant, including prostate cancer, renal cancer, nephrolithiasis, ED, hypogonadism, infertility, and incontinence. Being aware and, in a helpful manner, making our patients aware of the increased risks and options for help, gives clinicians the opportunity to improve not only the patients' urologic health, but their overall well-being. We need physician leaders who are committed to making Americans more health conscious and to start this consciousness by conquering the obesity epidemic within the next 10 years. ■

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MAIN POINTS

- More than 20% of adults in the United States are clinically obese, defined by a body mass index (BMI) of 30 kg/m^2 or higher, and an additional 30% are overweight, with a BMI between 25 and 30 kg/m^2. Although obesity may not attract the degree of attention that heart disease and cancer do, it is a serious public health issue. Experts agree that, as more and more obese children become obese adults, the diseases associated with obesity, such as heart disease, cancer, and particularly diabetes, will surge.
- Causes of obesity include increased caloric consumption, lack of physical activity, genetics, sleep deprivation, prescription medication use, and inflammation, among others.
- Obesity increases the risk of urologic diseases and complications, including prostate cancer, urinary incontinence, nephrolithiasis, erectile dysfunction, urinary tract infections, and male infertility.
- Postoperative complications associated with obesity include pulmonary and cardiac disorders such as hypoventilation, atelectasis, pulmonary embolism, and arrhythmias. Metabolic imbalances and wound infection risks also escalate in the obese patient.

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